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G02B 7/10(52) UK CL (Edition L)  
G2J J23C(56) Documents cited  
GB 2244346 A  
US 4993815 A  
US 4154510 AGB 2237406 A  
US 4934789 A  
US 4099847 AGB 1134777 A  
US 4307951 A(58) Field of search  
UK CL (Edition K) G2J J23C  
INT CL<sup>5</sup> G02B

(54) Zoom lens mount having open-ended slots

(57) A zoom lens mount comprises a fixing sleeve 12, a cam sleeve 11, a front lens holder 13, a rear lens holder 14, a back cover 17, and four rollers 18, 19, 20, 21. The fixing sleeve 12 has a cam slot 121 and three longitudinal slots 124 and the cam sleeve 11 has a longitudinal slot 111 and three cam slots 112, 114. The rollers are fitted into screw holes 15, 16 in the front and rear lens holder first, then the rollers are placed in the longitudinal slots and the cam slots by way of notches 101, 102 and finally the back cover 17 is fitted to the fixing sleeve 12 by means of pins so that the front and rear lens holders are prevented from falling out of the fixing sleeve and the cam sleeve.

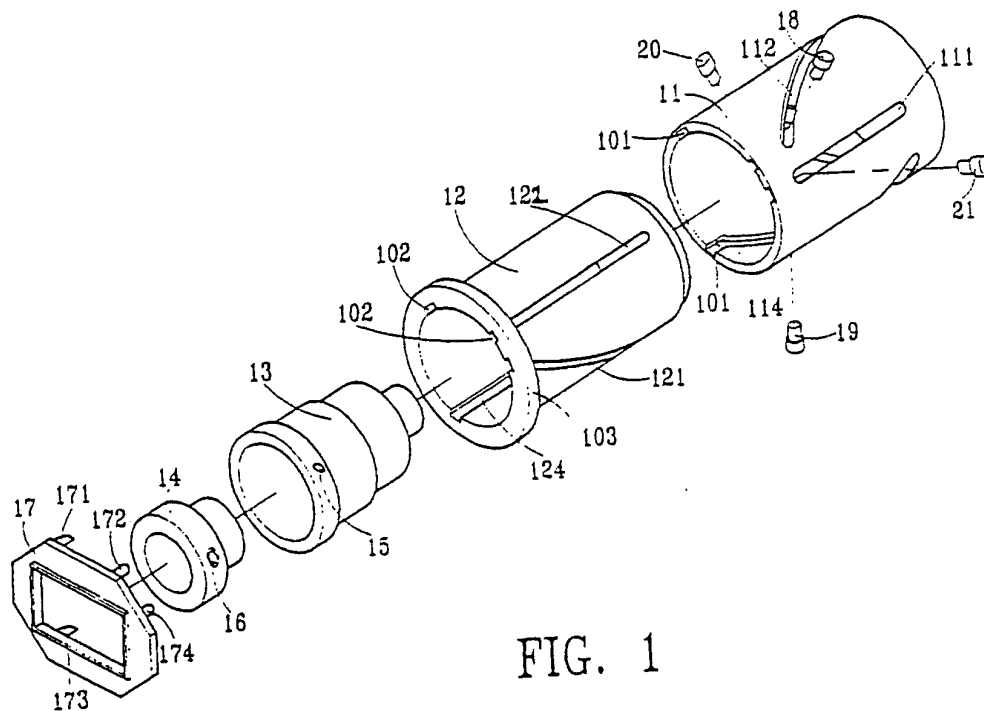


FIG. 1

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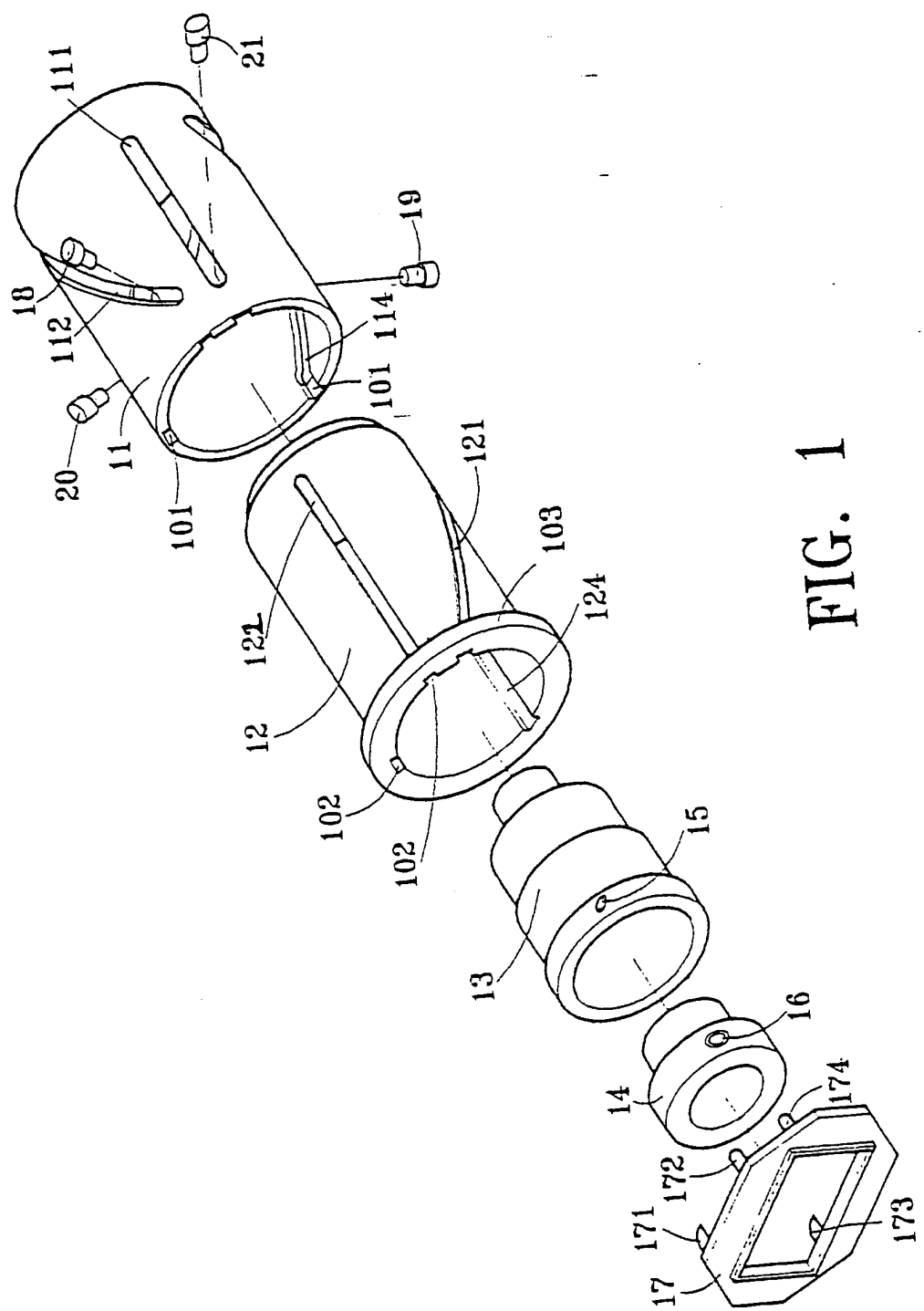


FIG. 1

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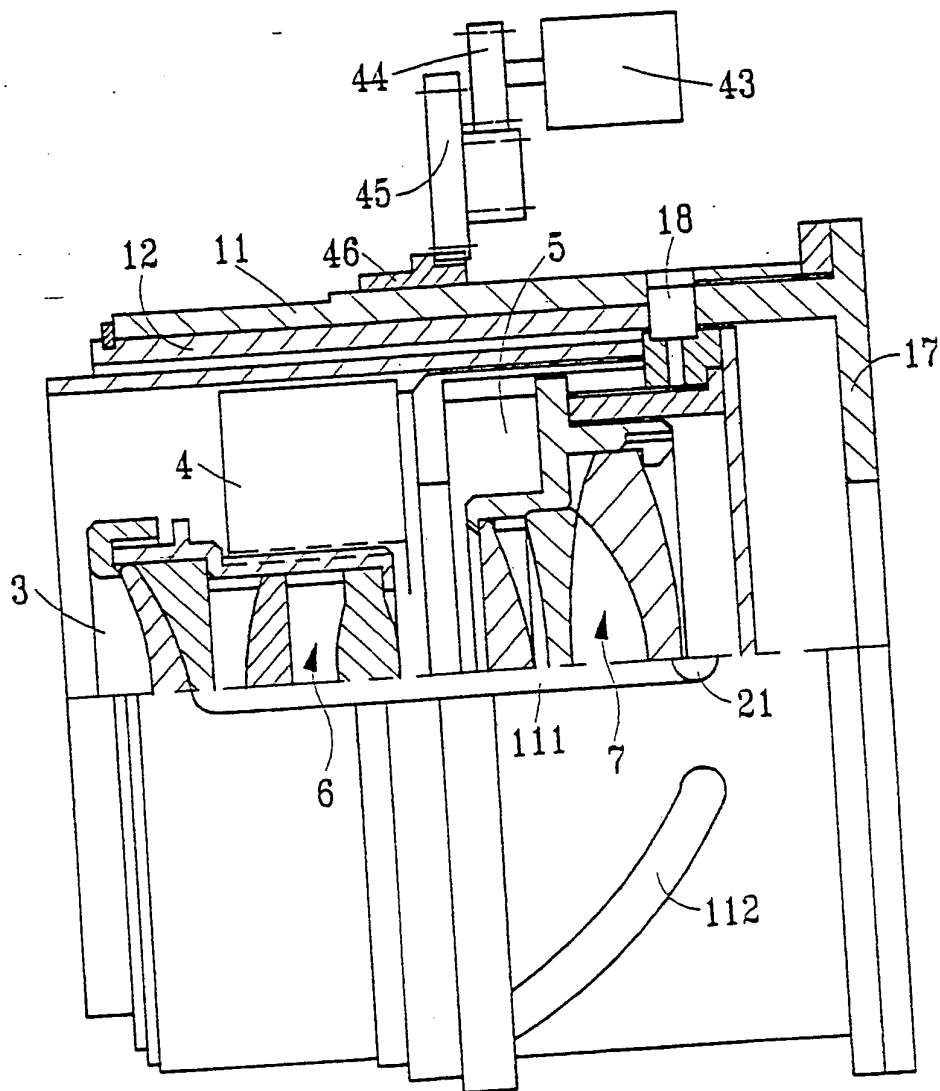


FIG. 2

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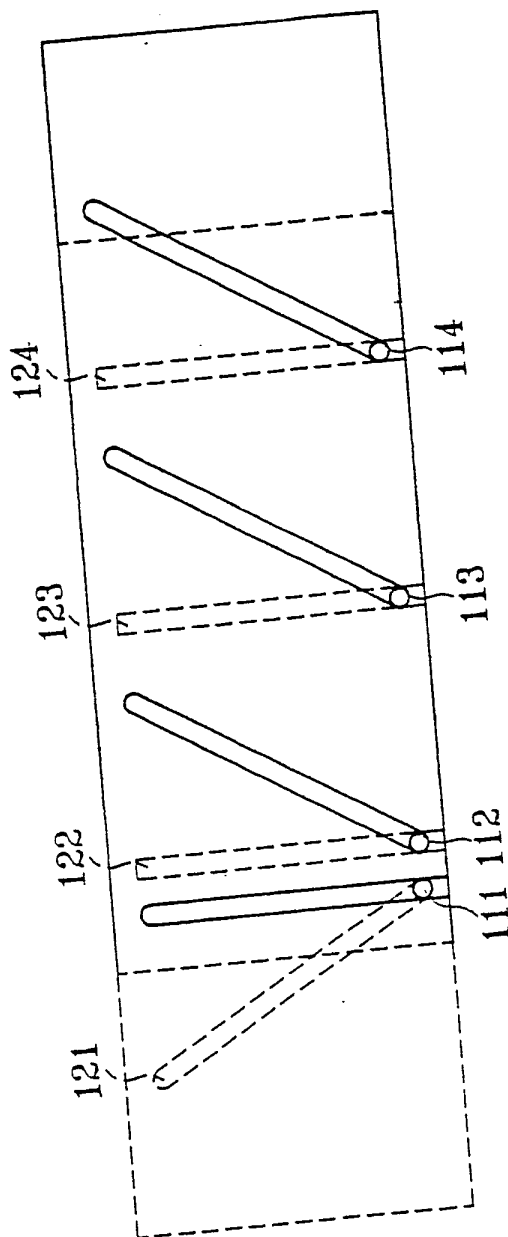


FIG. 3

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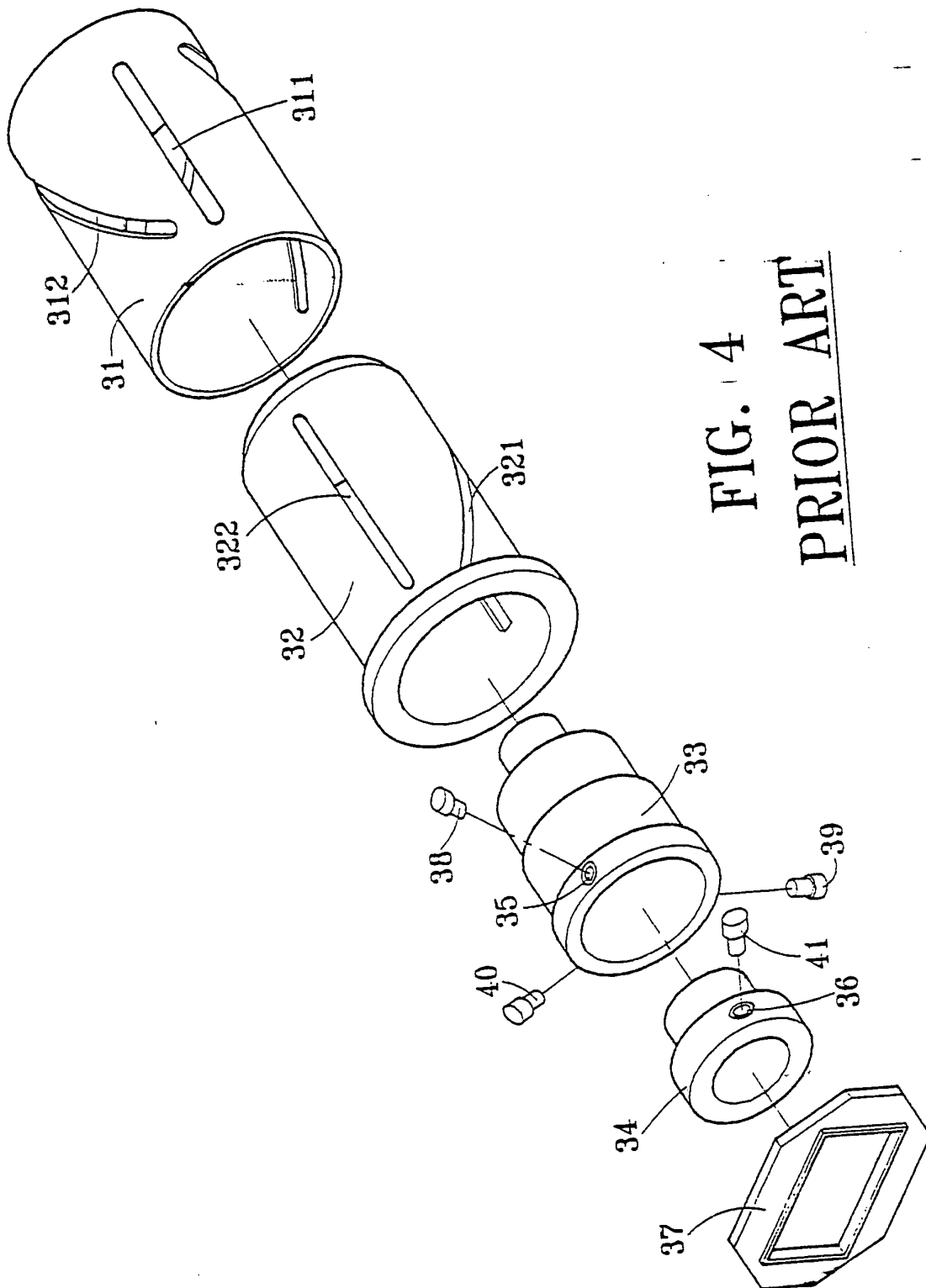


FIG. 4  
PRIOR ART

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ZOOM LENS FIXING MECHANISM

5 The present invention relates to an improved zoom lens fixing mechanism, particularly a zoom lens fixing mechanism which is easy to assemble with a simple and automatic procedure for the lowering of production costs and for the improvement of production efficiency.

10 Conventionally, a zoom lens fixing mechanism, as shown in Fig. 4, comprises a cam sleeve 31, a fixing sleeve 32, a front lens holder 33, a back lens holder 34, four rollers 38, 39, 40 and 41, and a back cover 37. After fitting of the front lens holder 33 to the rear lens holder 34, an end of the front lens holder 33 is placed in the fixing sleeve 32, and then into the cam sleeve 31 for assembly. The cam sleeve 31 has a longitudinal slot 311 and three cam slots 312 in its body, and the fixing sleeve 32 has a cam slot 321 and three longitudinal slots 322 corresponding to the longitudinal slot 311 and the cam slots 312 of the cam sleeve 31 respectively.

20 The front lens holder 33 has three screw holes 35 and the rear lens holder 34 has a screw hole 36 corresponding to the cam slot 321 and longitudinal slots 322 of the fixing sleeve 32 and the longitudinal slot 311 and cam slots 312 in the cam sleeve 31. Before fitting the roller 41 into the screw hole 36 in the rear lens holder, the roller 41 must be caused to pass the longitudinal slots 311 in the cam sleeve 31 and the cam slot 321 in the fixing sleeve 32. On the other hand, the rollers 38, 39 and 40 must be caused to pass the three cam slots 312 in the cam sleeve 31 and the three longitudinal slots 322 in the fixing sleeve 32 before they are fitted into the three screw holes 35

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in the front lens holder 33, while the roller 41 passes through the longitudinal slot 311 in the cam sleeve 31 and the cam slot 321 in the fixing sleeve 32, and is fitted into the screw hole 36 in the rear lens holder 34. Assembly of the zoom lens fixing mechanism is finally completed by the fitting of the back cover 37. In such a structure, the front and rear lens holders 33 and 34 can be moved in opposite directions by moving of the rollers 38, 39, 40 and 41 in the longitudinal slots 311 and 322 and the cam slots 312 and 321. However, as described, the rollers 38, 39, 40 and 41 must be fitted precisely to the longitudinal slots 311 and 322 and the cam slots 312 and 321, but there is a resistance there. If one of the lens holders 33 or 34 is on a slant, the longitudinal slots 311 and 322 cannot align with the cam slots 312 and 321, and the rollers 38, 39, 40 and 41 cannot be fitted into the respective screw holes 35 and 36. Hence, a lot of time and labour will be wasted in the assembly, an automatic assembly procedure cannot be implemented, and the production cost cannot be lowered.

In view of the above deficiencies, the present invention now provides an improved zoom lens fixing mechanism which makes use of notches/openings at the end of each of the cam slots and longitudinal slots so that the rollers can be fitted to the front and rear lens holders first, the rollers are then run into the cam slots and longitudinal slots respectively, and finally the back cover is fitted to prevent the rollers from falling out. With such a structure, the assembly procedure is improved, an automatic assembly process can be implemented, wasted time and labour is minimised, and the production cost is lowered.

The main object of the present invention is to provide an improved zoom lens fixing mechanism to

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permit implementation of an automatic assembly process, to minimise waste of time and labour, to improve assembly efficiency, and to lower production costs.

5 The drawings show one illustrative embodiment of the present invention which is given by way of example.

In the drawings:

10 Fig. 1 is an exploded perspective view of the zoom lens fixing mechanism according to the present invention;

Fig. 2 is a partial sectional view of the zoom lens fixing mechanism;

Fig. 3 is a view of the cam sleeve and fixing sleeve assembled for the zoom lens fixing mechanism; and

15 Fig. 4 is an exploded perspective view of a conventional zoom lens fixing mechanism.

As shown in Figs. 1 and 2, the zoom lens fixing mechanism comprises a cam sleeve 11, a fixing sleeve 12, a front lens holder 13, a rear lens holder 14, four rollers 18, 19, 20 and 21, and a back cover 17. After assembly of the front lens holder 13 to the rear lens holder 14, an end of the front lens holder 13 is placed in the fixing sleeve 12, and then placed in the cam sleeve 11 for fitting together. The cam sleeve 11 has a longitudinal slot 111 and three cam slots 112, 113 and 114 in its body. The fixing sleeve 12 has a cam slot 121 and three longitudinal slots 122, 123 and 124 in its body. The longitudinal slot 111 and each of the cam slots 112, 113 and 114 has a notch 101 at one end of the cam sleeve 11. Each of the longitudinal slots 122, 123 and 124 and the cam slot 121 has an opening 102 extending to an end of the fixing sleeve 12 for an annular flange 103. The longitudinal slot 111 and the three cam slots 112, 113 and 114 in the cam sleeve 11 correspond to the cam slot

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121 and the three longitudinal slots 122, 123 and 124 respectively.

5 The front lens holder 13 has three screw holes 15 for fixing of the rollers 18, 19 and 20, and the rear lens holder 14 has a screw hole 16 for fixing of the roller 21 so that they can be pushed into the fixing sleeve 12 and the cam sleeve 11 by rolling of the rollers 18, 19, 20 and 21 along the cam slot 121, the openings 102 of the three longitudinal slots 122, 10 the openings 102 of the three longitudinal slots 122, 123 and 124, the longitudinal slot 111 and the notch 101 extending from the cam slot 112. The rollers 18, 19, 20 and 21 can be fixed to the screw holes 15 and 16 in advance by automatic equipment to eliminate the waste of labour required in the prior art, in which the 15 rollers 38, 39, 40 and 41 are fixed through the cam sleeve 31 and the fixing sleeve 32 after alignment of two screw holes 35 and 36.

After the said assembly, an automatic focusing mechanism 4 is fixed on the front lens holder 20 13 and has a roller to drive a front lens for focusing. A roller 21 is fixed into the screw hole 16 in the rear lens holder 14 to drive a rear lens for axial displacement. The back cover 17 is finally fixed by the fitting of four pins 171, 172, 173 and 174 into 25 their respective corresponding notches 101 in the cam sleeve 11 and openings 102 of the fixing sleeve 12.

As shown in Figs. 2 and 3, upon operating a motor 43, a driving ring 46 is driven via a reducing gear 44, and consequently the cam sleeve 11 is driven 30 by the driving ring 46 for rotation. Then, the roller 18 moves along the cam slot 112, and the front lens holder 13 is displaced axially, while the roller 21 moves along the cam slot 121 so that the rear lens holder 14 rotates in the direction opposite to that of 35 the front lens holder 13. The rear lens holder 14 is

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indeed acting as a cylindrical cam to drive a rear lens to move axially. Therefore, the lenses 6 and 7 move axially in opposite directions for zooming.

According to the present invention, each of  
5 the longitudinal slots 111, 121, 122 and 123 has a notch 101 at their respective ends and each of the cam slots 112, 113, 114 and 121 has an opening 102 at their respective ends; the front lens holder 13 and the rear lens holder 14 can be assembled together and then  
10 fitted with the rollers 18, 19, 20 and 21 to become an assembly for placing into the fixing sleeve 32 and the cam sleeve 31 by inserting the rollers 18, 19, 20 and 21 into their corresponding notches 101 and/or openings 102; and finally the back cover 17 is fixed by means  
15 of the pins 171, 172, 173 and 174 to prevent the rollers 18, 19, 20 and 21 from falling out. Therefore, the entire assembly procedure is simple and time-saving. It can lower production costs, and it is a procedure which is suitable for automatic production  
20 with the highest production efficiency.

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Patents Act 1977  
Examiner's report to the Comptroller under  
Section 17 (The Search Report)

- 7 - Application number

9123841.0

Relevant Technical fields

(i) UK Cl (Edition K ) G2J (J23C)

(ii) Int Cl (Edition S ) G02B

Databases (see over)

(i) UK Patent Office

(ii)

Search Examiner

MR C J ROSS

Date of Search

11 MARCH 1992

Documents considered relevant following a search in respect of claims

1 AND 2

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
E X	GB A 2244346 (ASAHI) 27 November 1991 see especially page 5 line 20 on	1
X	GB A 2237406 (ASAHI) See especially page 5 line 33 on	1
X	GB 1134777 (SCHNEIDER) See especially Figure 2	1
X	US 4993815 (OLYMPUS) See especially column 3 line 55 on and column 4 line 32 and 56 on	1
X	US 4934789 (LEMKE) See the Figure	1
X	US 4307951 (OSAWA) See especially column 2 line 49 on	1
X	US 4154510 (SANKYO) See especially column 3 line 66 on	1
X	US 4099847 (NITTO) See especially groove 14 Figure 4	1

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Category	Identity of document and relevant passages	Relevant to claim(s).

### Categories of documents

X: Document indicating lack of novelty or of inventive step.

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P: Document published on or after the declared priority date but before the filing date of the present application.

E: Patent document published on or after, but with priority date earlier than, the filing date of the present application.

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